

PP Presentation

Routing Attacks

- Hit-and-Run Attack: hard to detect/isolate
 - Inject one (or very few) bad packet causing long term damage.
- Persistent Attack:
 - The intruder has to continuously inject attack packets.
- Attack Experiments:
 - Max-Sequence Number attack (implem. bugs)
 - MaxAgeDiff attack (weak checksum algo.)

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Sequence #: Counter Flushing

ATM

(1) Seq#: 0x7FFFFFFF

(2) 0x7FFFFFFF with

MaxAge to purge

this entry.

(3) 0x80000001.

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Attack and Fight-Back

ATM

Seq#

(1) 0x90001112

(2) 0x90001113

(3) 0x90001114

fight-back

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MaxSeq# Attack

ATM

Seq#

(1) 0x90001112

(2) 0x7FFFFFFF

MaxSeq#

(3) 0x80000001

fight-back

(4). 0x7FFFFFFF

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Max-Sequence Number Attack: Features

- Hit-and-Run attack (hard to identify/isolate)
- Implementation Bug! (confirmed in two independent and well known packages)
- Reason: MaxSeq# LSA Purging has not been implemented correctly!!
- Impact: The intruder can "control" the topology database for up to an hour.

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Probabilistic MaxAgeDiff Attack

Probabilistic MaxAgeDiff Attack

- "Sort-of" Hit-and-Run Attack on the RFC directly.
- Preventable by OSPF Digital Signature.
- Still in progress (not yet implemented, and could be a fake attack). We need to verify the timing information in our OSPF routing testbed.

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Undetected Tampering

1 of 1

Undetected Tampering

Undetected Tampering

ATM

Seq#

(1) 0x90001112

- 0x90001112

the same checksum

but different value

They are the same, so not

take or forward.

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Fresher LSA?

1 of 2

Fresher LSA?

Fresher LSA?

Seq#A ? Seq#B

ChS:A ? ChS:B

AgeA-AgeB

=

=

>

>

<

<

A

A

A

B

B

B

15

-15

Fresher LSA?

2 of 2

otherwise

A, B are treated the same.

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Linear Case: LSA Age.

1 of 1

Linear Case: LSA Age.

Linear Case: LSA Age.

E

D

C

B

15:0 14:0 16:0 15:0 0:0

15:1 14:1 16:1 0:1 0:1

15:2 14:2 0:2 0:2 0:2

15:3 14:3 0:3 0:3 0:3

Less than 15 minutes

STOP Here!

I don't

know...

A

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Attacker's (E) Learning Phase

Attacker's (E) Learning Phase

1. Wait for MaxAgeDiff

(15 minutes) before

mess-up one LSA (the

same Seq#, the same

checksum, but 0 age.)

2. Check if the originator(A)

fight-back or not:

- If YES, try

- MaxAgeDiff + delta

- If NO, try

- MaxAgeDiff - delta

Attacker

Victim

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MaxAgeDiff Attack

MaxAgeDiff Attack

- Learning Phase:
 - Find out the optimal timing to control the largest possible area of good routers.
 - The learning itself can be undetectable.
- Attack Phase:
 - Launch one bad LSA after the optimal timing.
 - The network topology may be partially controlled for about 15 minutes.
 - $LSRefreshInterval - MaxAgeDiff = 30 - 15 = 15$.

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What's Next:

- Implement the module code
- Collect more routing traffic statistical profiles
- Conduct code analysis on GateD (OSPF portion)
- Construct simulator to understand the impact of attack on a large scale network

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electronic and information technologies

ADVANCED NETWORKING RESEARCH (ANR)

The Advanced Networking Research group at MCNC engages in a variety of research and development projects, involving security solutions for protection of information infrastructures and system solutions for high-speed networking. In addition to its independent R & D projects funded by federal agencies such as DARPA, the group also provides development and consulting services to other technology developers and users.



Projects Highlights

- **CELESTIAL**

- Development of a security service management architecture for heterogeneous networking environment
- Enhancing the survivability of networking infrastructures and promoting wide deployment of security services

- **Ji-Nan**

- Development of an intrusion detection system for emerging internetwork environment
- Provide protection for the routing infrastructure through SNMP integrated solution

- **Enigma2**

- Development of a cell-level security system for ATM/SONET public network standards
- Provides full-bandwidth, full-duplex encryption at OC-12c (622Mbps) and OC-3c (155Mbps)

- **Integrated QoS**

- Porting/implementation of QoS provisioning protocols and mechanisms in NetStar GigaRouter
- Evaluation through experiments and comparisons

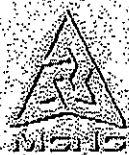
- **Attila**

- Development of a Dynamic BISDN Traffic Analysis System
- Built around the ATM and SONET public network standards

- **VISTAnet**

- Research in communications, graphics, and medical applications utilizing a gigabit testbed
- One of the five gigabit network testbeds that have been selected for funding by the Corporation for National Research Initiatives as part of a program supported by NSF and ARPA

MCNC Homepage



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New Ideas

Impact

Schedule

- Comprehensive approach for intrusion detection on network

infrastructure

- Offering prevention, detection, response, and reconfiguration capabilities

- Flexible architecture design which can target at any network

protocol of interest (select three key protocols: OSPF, PNNI, and SNMP as implementation examples)

- Coupling with network management to enable automated

responses and easy integration with other systems

- Providing comprehensive capabilities to protect network

infrastructures

- Resulting better understanding in security implications of

key network protocols

- Contributing to the IETF and vendors community regarding the

the finding of security vulnerabilities in protocol specification

and implementation

- Easy integration to be part of a fault management system

through the built-in network management component

- Can be commercialized/deployed to operational network

routers/switches

Start

JiNao IDS architecture

specification complete

Statistical profile

delivery

Modules code

delivery

Demo of JiNao

system implementation

Demo of JiNao

implementation

after refinement

Evaluation

Final

report

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Scalable Intrusion Detection for the Emerging Network Infrastructure (JiNao)

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<http://web.archive.org/web/19971017111157/www.mcnc.org/HTML/ITD/ANR/qchart/isl001.htm>

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